

Reconstruction of nasal defects using subcutaneous axial pedicled forehead flaps

Subcutaneous axial pedicled forehead flap

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Abstract

Aim: The forehead region is the ideal site for nasal reconstruction, and the biggest disadvantage of the forehead flap used for this purpose is that it requires two or three sessions of surgery. Subcutaneous pedicled forehead flap was described previously. However, venous congestion was observed because the vein was ignored while the flap was planned. For this reason, we made nasal reconstruction with forehead flap in one stage and planned the flap pedicle to include the vein and artery together. **Material and Method:** The data of 8 patients who underwent axial subcutaneous pedicled forehead flap due to a defect in the proximal 2/3 of nose between January 2016 and January 2018 were analyzed retrospectively. The mean age of the patients was 62.88 and the mean follow-up period was 14.13 months. **Results:** The operations lasted 85 minutes on average and nasal defects were reconstructed with a single stage forehead flap. Clinically, we observed less venous congestion and less bleeding. No partial or total loss was observed in any flap. All patients were discharged on postoperative day 1. **Discussion:** The subcutaneous axial pedicled forehead flap can be safely used for defects in the superior 2/3 of the nose. However, larger superficial vein should be determined first and then the flap pedicle should be planned by marking the artery while planning this flap. In this way, nasal reconstruction is made in one session with a subcutaneous pedicled axial forehead flap that includes both artery and vein.

Keywords

Forehead Flap; Subcutaneous Pedicled Flap; Nasal Reconstruction; Axial Flap

DOI: 10.4328/ACAM.6186 Received: 25.01.2019 Accepted: 25.02.2019 Published Online: 01.03.2019 Printed: 01.03.2020 Ann Clin Anal Med 2020;11(2):138-141

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Introduction

The use of the forehead in nasal reconstruction dates back to 1000 BC and is known as the India method [1]. At the time of the introduction of this flap, the flap was planned to have a wide pedicle and to be in the midline. The pedicle contained supratrochlear artery of both sides, and sometimes both the supratrochlear and supraorbital arteries of both sides, and the rotation arc of the flap was quite limited [1]. Later on, anatomical studies have shown that the paramedian forehead flap can be lifted through the narrow pedicle, including one side of the supratrochlear artery and the angular artery [2-5]. However, the pedicle of these flaps was made to include the supratrochlear artery and the skin island on it. Therefore, the second operation was required to cut the pedicle in the paramedian forehead flap [6,7].

Later, the forehead flap was started to be made in one stage. For this purpose, in the first defined forehead flap, wide subcutaneous pedicle in the middle part of the forehead was turned under the skin of the glabellar region. This planning resulted in significant venous congestion in the flap and glabellar fullness [8]. This limited the use of the single-stage forehead flap. Recently, mostly small nasal defects were reconstructed with a single-stage forehead flap [9,10]. The most important problem was venous congestion and to reduce this congestion the resection of the procerus muscle and extensive undermine the skin in the glabellar region was performed [9].

We used the subcutaneous axial pedicled forehead flap for defects in proximal 2/3 of the nose. This flap has been previously described [8-11]. However, in these patients, we planned the pedicle of the flap to include both the artery and the vein in order to be a complete axial flap.

Material and Methods

This study included 8 patients who underwent subcutaneous axial pedicled forehead flap due to a defect in proximal 2/3 of the nose between January 2016 and January 2018. Data of these patients were analyzed retrospectively. The mean age of the patients was 62.88 and the mean follow-up period was 14.13 months (Table 1). Ethics committee approval was obtained from the Antalya Education and Research Hospital Ethics Committee.

Surgical Procedure

First, the excision of the nasal lesion was planned and the size of the defect was measured. While the patients were at the supine position the supratrochlear vein was marked on the forehead where the vein was larger. The vein was easily seen by the Valsalva maneuver when the vein could not be seen directly. On the prominent vein side, 16-20 mm lateral to the midline, the possible localization of the supratrochlear artery was marked. The subcutaneous pedicle was designed to include both the superficial supratrochlear vein and the deeper supratrochlear artery and 2-3 mm intact tissue on the edge thereof. The length of the pedicle was planned as the pivot point of the flap would be superior orbital rim so that the flap could reach the defect without tension. The size of the flap was planned according to the size of the defect (Figure 1).

The lesion in the nose was excised with proper intact margin. Then the forehead flap was lifted from the distal to proximal part from the vicinity and at the base from between the frontal muscle and the periosteum except for the pedicle portion. An incision extending from the flap to the defect was performed

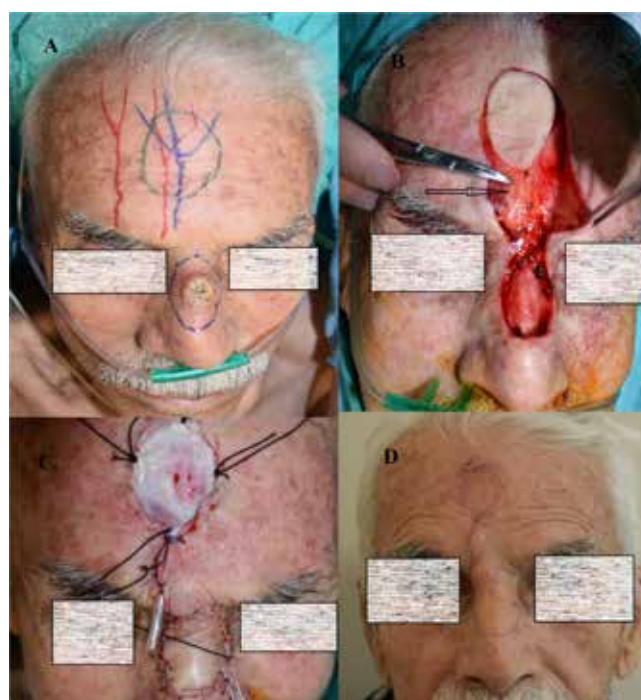


Figure 1. A. Eighty-seven-year-old male patient. Excision was planned with the diagnosis of SCC in the dorsum of the nose. The flap was planned from the right forehead where the vein was prominent. B. The tumor was excised and the subcutaneous axial pedicled forehead flap, including both the artery and the vein, was lifted. The arrow shows the superficial vein. C. The flap was inset on the defect and the donor area was repaired with FTSG. D. Reconstruction was completed in a single session. The first month postoperatively.



Figure 2. A. A 52-year-old female patient with BCC in the nasal dorsum. B. The defect was repaired with a subcutaneous axial pedicled forehead flap. Flap donor area was repaired primarily. Venous congestion was not observed in the flap.

Table 1. Demographic data of patients

Case	Age / gender	Localization	Defect size (mm)	Flap donor area repair	Diagnosis	Follow up time (months)
1	44/F	Dorsum +right side	21X15	Primary	Actinic keratosis	24
2	80/M	Dorsum+ left side	30X34	FTSG	SCC*	8
3	61/F	Dorsum	23X29	Primary	BCC	13
4	52/F	Dorsum + right side	20X30	Primary	BCC	24
5	58/M	Dorsum	24X27	Expander+ primary	SCC	17
6	61/M	Dorsum	27X34	Primary	BCC	23
7	60/F	Dorsum + right side	24X33	Primary	BCC	1
8	87/M	Dorsum	16X28	FTSG	SCC	3

F; female, M; male, FTSG; full thickness skin graft, SCC; squamous cell carcinoma, BCC; basal cell carcinoma, * Re-excision was performed due to the surgical margin was positive and the mucosa was repaired with FTSG.

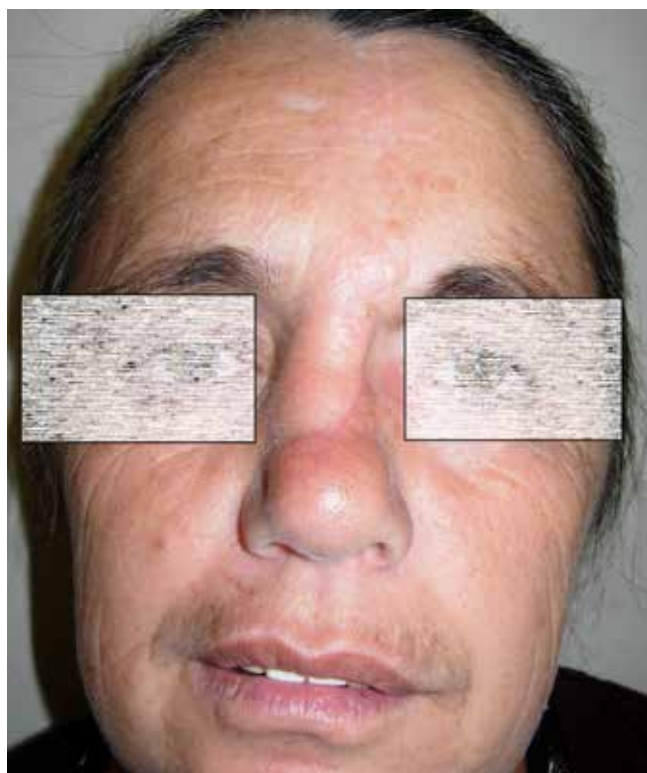


Figure 3. Postoperative 11 months. Eyebrows are symmetrical and donor area scarring is minimal.

on the pedicle and the skin on the pedicle was lifted with the thin subcutaneous fat tissue on both sides of the incision, up to the edge of the pedicle. At the base, up to two cm superior to the orbital rim, pedicle was lifted over periosteum, below this level under periosteum. Then the flap was rotated 180 degrees and sutured in the defect. The flap donor area was repaired primarily in five patients and full-thickness skin graft from the supraclavicular region was performed to the remaining three patients (Figure 2,3). In a patient with a skin graft, the donor area was expanded with tissue expander and then was repaired primarily. In one patient, tumor excision resulted in a full thickness defect in the nose. Nasal mucosa was repaired with full thickness skin graft for this patient.

Results

All operations were performed under sedoanalgesia and the operations lasted 85 minutes on average. The nasal defect in all patients was reconstructed with a single stage forehead flap. Clinically, patients had less venous congestion and hemorrhage than the two-stage forehead flaps that we did. No partial or total loss was observed in any flap. All patients were discharged on the first postoperative day. The glabellar fullness observed at the pivot point of the pedicle was spontaneously resolved within a few months as a result of atrophy of the frontal muscle. The symmetry of the eyebrows was not impaired in any patient. The results were more satisfactory for both the surgeon and the patients than the previous two-stage forehead flaps (Figure 4).

Discussion

The forehead area is the ideal area for nasal reconstruction. Advantages of using forehead flap versatile for nasal reconstruction are good color and texture match. The forehead flap is usually performed in two or three sessions [6,12]. The disadvantages are multiple-session surgery, cost more, long stay



Figure 4. A. 61-year-old male patient. Excision was performed due to BCC in the dorsum of the nose. B. Postoperative third month. Results are quite good aesthetically.

away from work, long-term wound care, being unable to wear glasses, being isolated from the community due to elephant's trunk deformity [6,7,13].

The paramedian forehead flap is defined as an axial flap because it is fed from the supratrochlear artery. While an axial flap should contain a vein, in the traditional forehead flap the pedicle is harvested with a skin strip to provide venous drainage. The supratrochlear artery is the terminal branch of the ophthalmic artery and approximately 2 cm from the midline enters the forehead from the supratrochlear notch. It pierces the procerus and corrugator supercilii muscles and feeds the paramedian forehead by running a course in the frontal muscle [14,15].

The supratrochlear artery has no accompanying vein but has only the surrounding adventitial vasa vasorum [16]. The venous drainage of the forehead, eyebrow, and upper eyelids is provided by the frontal branch of the supraorbital, supratrochlear and superficial temporal veins. The supratrochlear vein emerges from the venous plexus in the forehead. Then the supratrochlear veins take the course down in the midline and they are connected to each other by the transverse nasal arch at the dorsum of the nose [17].

The supratrochlear vein does not coexist with the supratrochlear artery. The average distance of the supratrochlear vein from the midline is 9.7 mm and the supratrochlear artery is 16.2 mm at the level of the superior orbital rim. The distance from vein to the midline varies from right to the left [18]. The localization of the supratrochlear artery in the forehead is fixed. However, the vein draining the forehead skin is thicker on one side [16]. Venous congestion due to extensive planning of subcutaneous pedicle was a significant problem in patients undergoing single-stage forehead reconstruction [8]. To reduce this, some methods were performed such as procerus muscle resection and dissection under the skin of the glabellar region. Later a one-stage subcutaneous island-shaped forehead flap was used in the reconstruction of the nose, medial canthus and lower eyelid [8,9]. Venous congestion and partial flap loss were reported in 50% of the forehead flap planned in this way [11]. In addition, this technique has been proposed only in patients with nasal upper region defects, who have no history of peripheral vascular disease, hypertension, diabetes, and radiotherapy [9]. Venous congestion is the major problem in the subcutaneous forehead flap [8,11]. The reason for this is that the pedicle is planned by considering only the localization of the artery.

Whereas, the supratrochlear vein is more superficial than the artery, takes course apart from the artery, it is thicker on one side [16,18]. Therefore, the subcutaneous pedicle was planned on the side where the supratrochlear vein was prominent and we selected the supratrochlear artery according to the vein placement side. In this way, a real axial flap was made. No venous congestion and related flap loss were observed in any of the patients.

While flap pedicle was prepared, an incision was performed between the flap and defect along the pedicle. The vein under the skin in the pedicle was protected and the skin flaps were lifted from both sides. The pedicle width was planned to include an additional 2-3 mm intact tissue from the vein and artery edge. Inserting the pedicle to the defect through the incised skin rather than the subcutaneous tunnel had two benefits. First, the superficial vein was fully preserved and the pedicle was opened wide enough. The second is that this incision was sutured intermittently, which prevented possible hematoma and its pressure on the pedicle.

Conclusion

The subcutaneous axial pedicled forehead flap can be safely used for defects located in the superior 2/3 of the nose. However, when planning this flap, the first thicker superficial vein should be determined, and then the flap and the pedicle should be planned by marking the artery of the same side. In this way, nose reconstruction was performed in one stage with axial forehead flap including both artery and vein.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Funding: None

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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How to cite this article:

Uslu A. Reconstruction of nasal defects using subcutaneous axial pedicled forehead flaps. Ann Clin Anal Med 2019; Ann Clin Anal Med 2020;11(2):138-141